Paper ID: 71164
oral
student

IAF SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
Interactive Presentations - IAF SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (IPB)

Author: Mr. Maximilian Henkel
Graz University of Technology (TU Graz), Austria, henkel@tugraz.at

IN-ORBIT RECOVERY OF OPS-SAT'S PROCESSING PLATFORM

Abstract

Any technical component can have faults. Such faults are even more likely on satellites in the harsh space environment. To minimise the damaging effects, space-grade components are well tested and carefully selected. In addition, there are mechanisms and procedures implemented to deal with error cases. Even so, only predictable error conditions can be accounted for. One year after OPS-SAT's launch, a severe fault occurred: One of its two main processing platforms failed. Moreover, the redundant platform showed a serious hardware problem with its main SDRAM. This is usually deemed as the end of the satellite mission, because a core payload and its redundant twin are unavailable. Here, we show a recovery from this dead end situation. Thanks to the flexibility of OPS-SAT's processing platform, the way forward was offered by in-flight reconfiguration of the integrated Field-Programmable Gate Array (FPGA). The results show that even fatal errors can be mitigated by introducing hardware flexibility. It also encourages for increased use of in-flight reconfigurable hardware and FPGAs in particular. Furthermore, this in-flight demonstration on the OPS-SAT mission shows that employing such an approach can significantly prolong overall mission lifetime.